



Flagstaff Water Services DPR Feasibility and Outreach

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Advanced Treatment Facility for Direct Potable Reuse

WHY NOW?

- Water Resources Master Plan
 - As Flagstaff plans for the future, new sources must be evaluated
- Rule Change
 - Prior to 2018, there was a prohibition on direct potable reuse



2017 Water Deliveries

GROUNDWATER

5,921 AF 58%

SURFACE WATER

1,766 AF 21%

RECLAIMED WATER

2,189 AF 21%

*Water Conservation – decrease
in GPCD ~40% since 1980s*

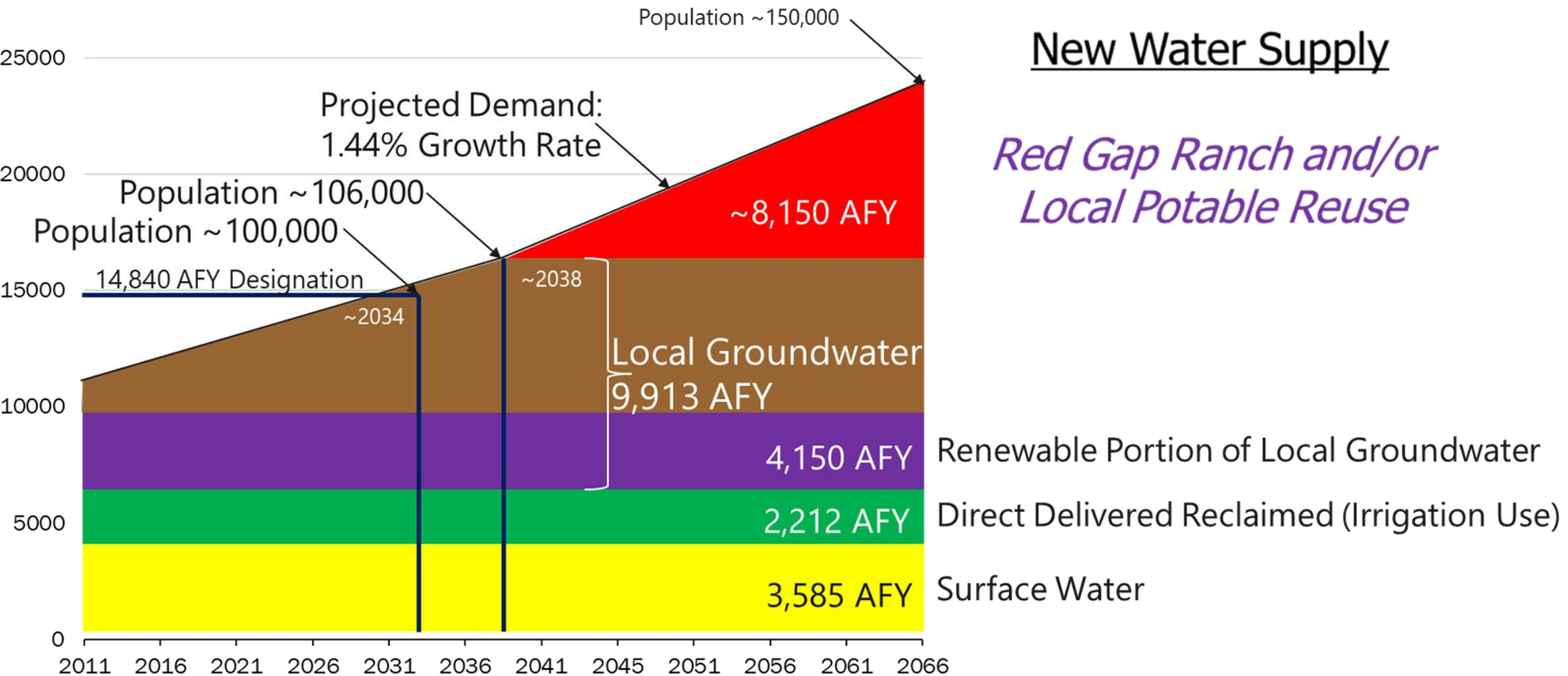
Upper Lake Mary



Construction Water



Flagstaff Must Be Proactive to Obtain New Water Supplies



DPR is Just One Way to Provide Water for Future Generations



Direct Potable Reuse or Indirect Potable Reuse

Public Outreach Prior to Rule Change

- Pure Water Brew Challenge – Parallel with Rule Rewrite
- ADEQ Substantive Policy
 - April 27, 2017
 - Purpose was to provide a temporary interpretation of “direct reuse for human consumption” under current reclaim rules
 - Provides definition for “Advanced Water Treatment Facility”
- Advanced treatment reclaimed water permit
 - First and only in state

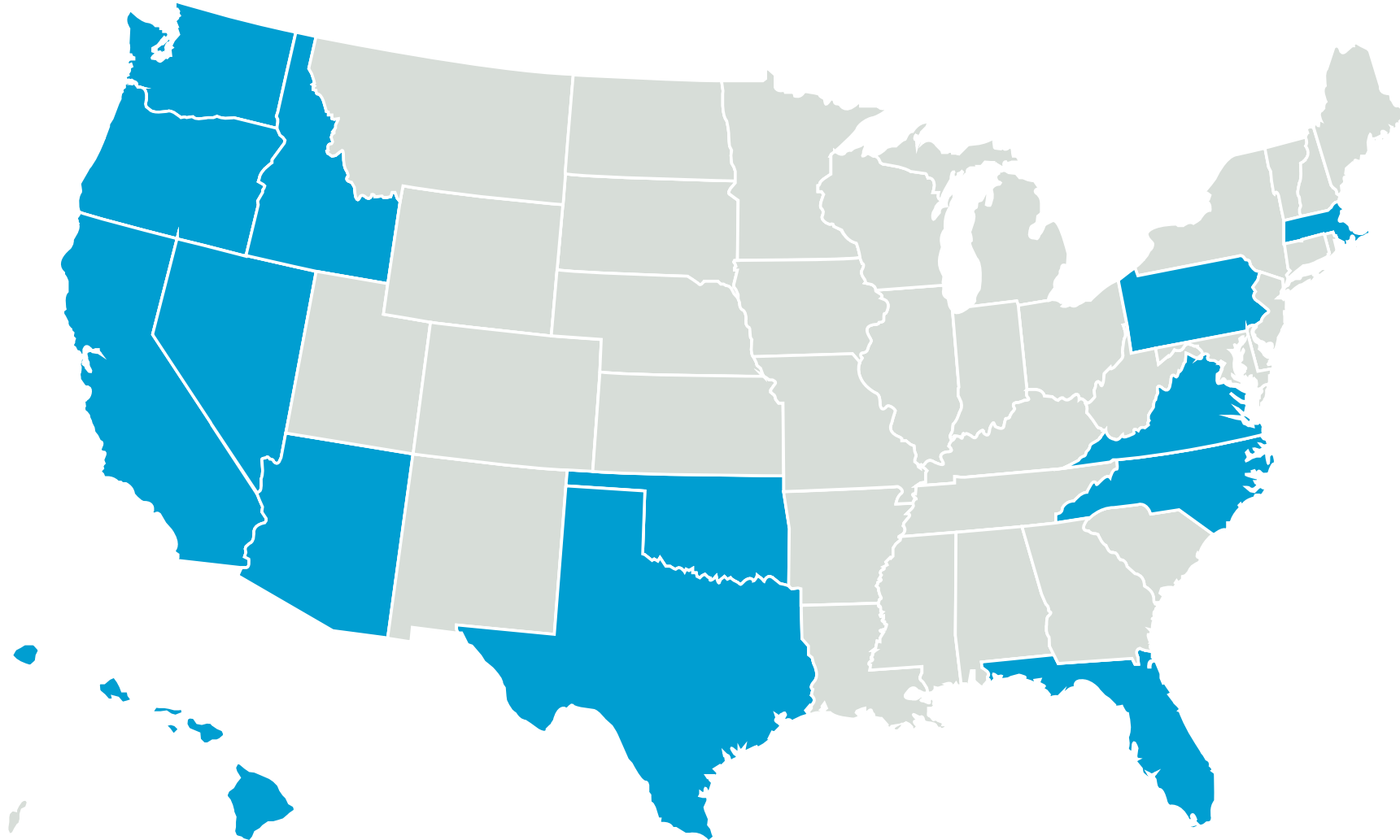


Public Outreach Component

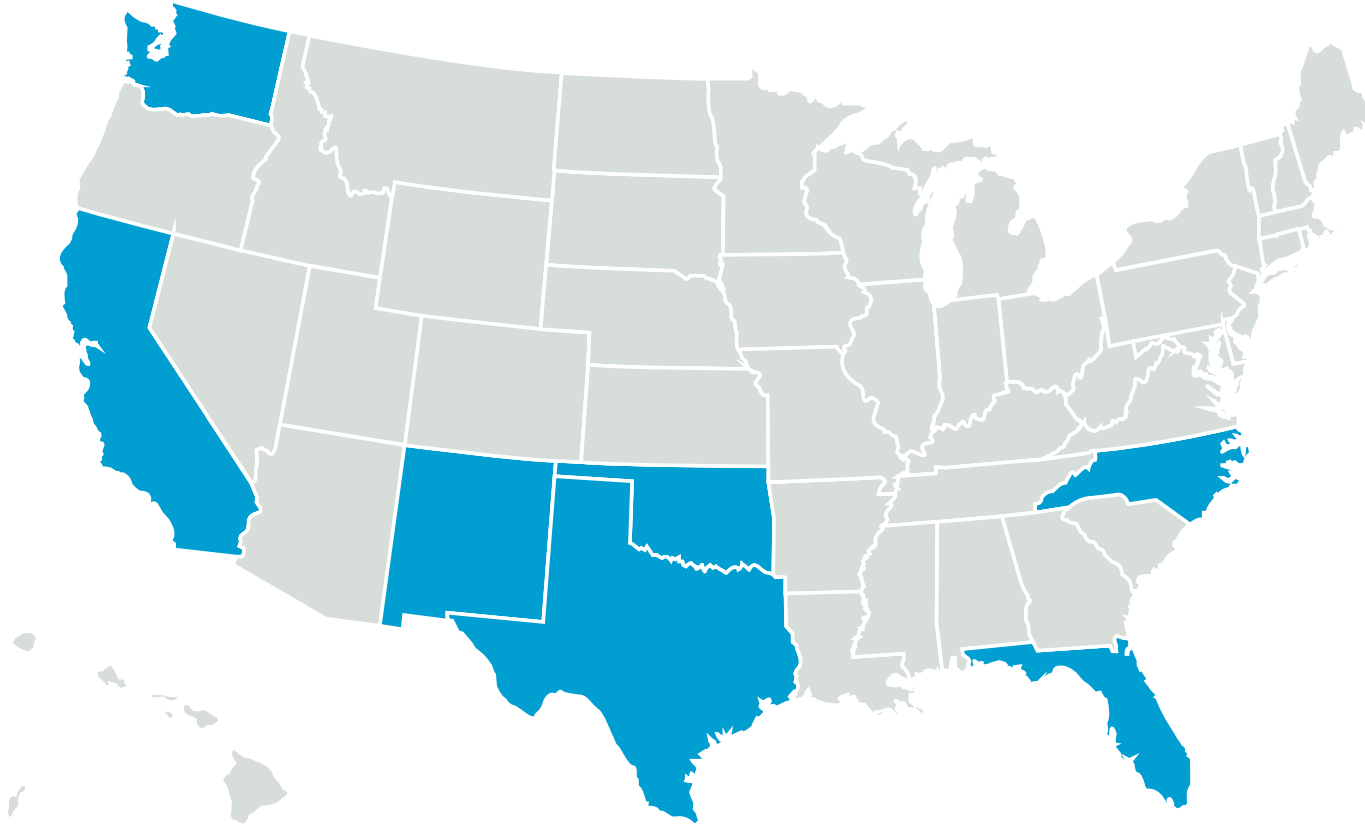


First Direct Potable Reuse mobile facility produced purified water in Tucson, Phoenix and Flagstaff to make beer!

States with Indirect Potable Reuse Rules



Status of DPR Rules by State



California: Rule expected in 2018

North Carolina: Senate Bill passed in 2017

Texas: DPR approved on case by case basis (3 projects)

Washington: Approved on case by case basis

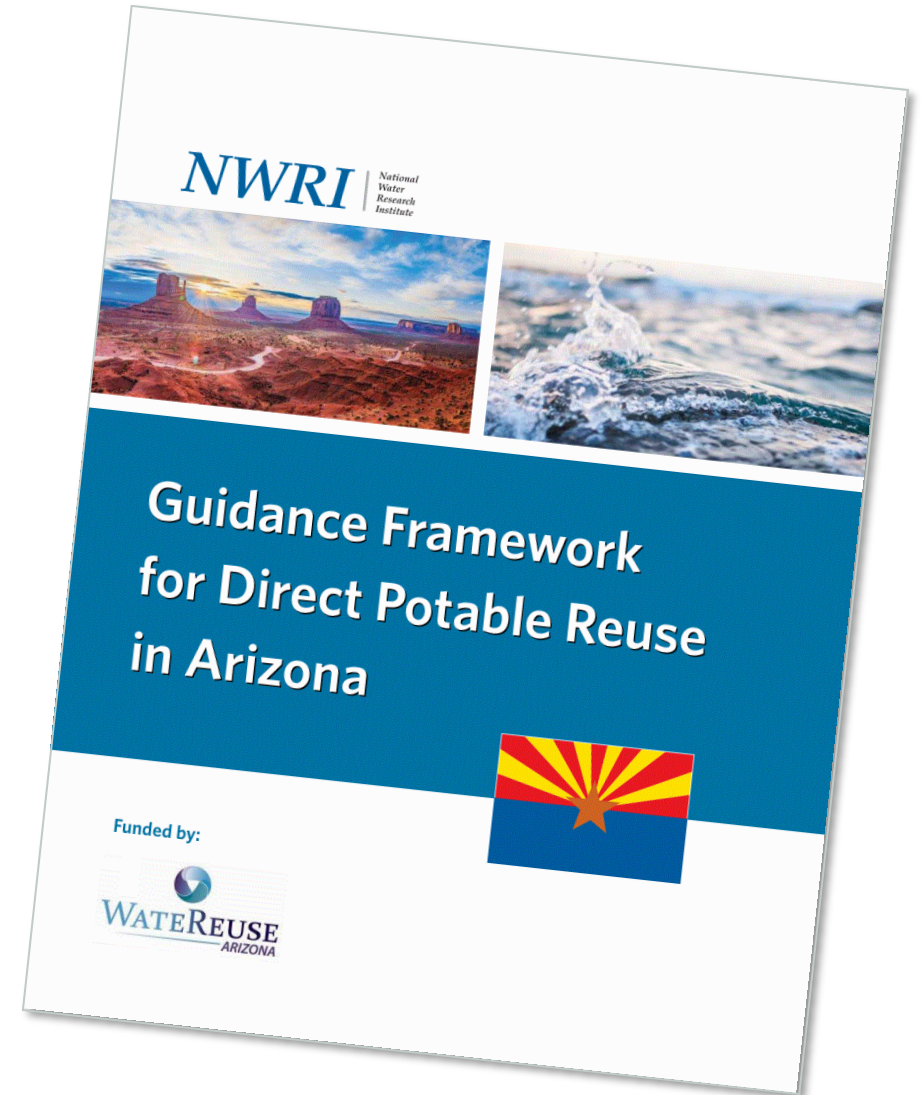
Oklahoma: In development

New Mexico: Framework document only

Florida: Investigating

Status of Arizona DPR Rules and Regulations

- 2017: ADEQ workgroups Reuse Rule Update and recommendations for advanced treatment rules
 - Recycled Water Quality Water Standards
 - Recycled Water Infrastructure and Technology
- January 1, 2018:
 - DPR Prohibition Rescinded,
 - Interim rule for advanced treatment pilot projects
- January 31, 2018: WaterReuse AZ releases the “Framework for Direct Potable Reuse in Arizona” prepared by NWRI
- **Final rule and guidance for advanced treatment under development**



Regulatory Approach

Microbial Contaminant Control

- **Texas Approach: Characterize treated WW like SDWA approach**
- **California Approach: 12-10-10 log removal starting from raw WW**

Chemical Control

- **Tier 1: Drinking Water MCLs**
- **Tier 2: Unregulated but of interest for public health**
- **Tier 3: Unregulated, used to monitor treatment performance**

What's unique about Arizona's approach



- Recommending either California or Texas Approach to treatment performance requirements
- RO explicitly not required unless needed for salinity management
- Must demonstrate compliance with Class A+ quality at some point along process train

Review

- Flagstaff Needs Future Water Source to Maintain Growth
- Pure Water Brew Challenge – DPR is Possible and Safe
- Rule Rewrite – Prohibition Removed
- Future Rules for DPR with ADEQ – Arizona Approach



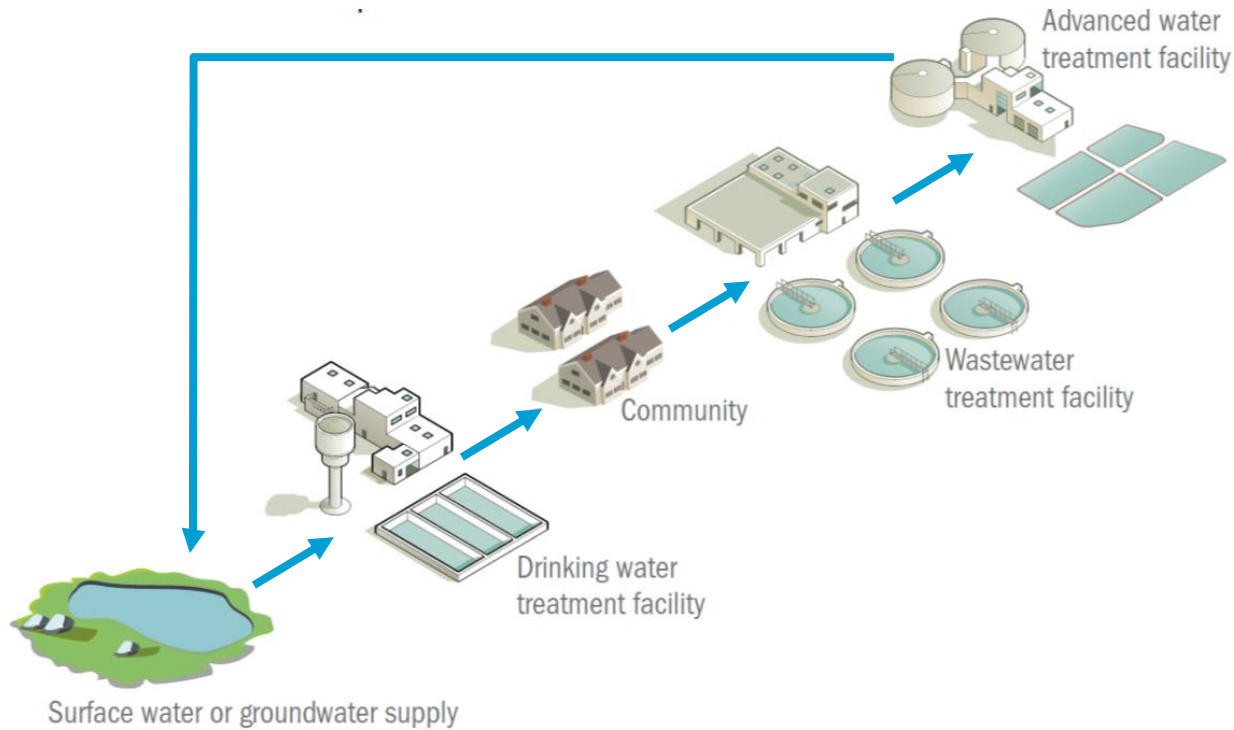


FLAGSTAFF
WATER SERVICES
We are Water

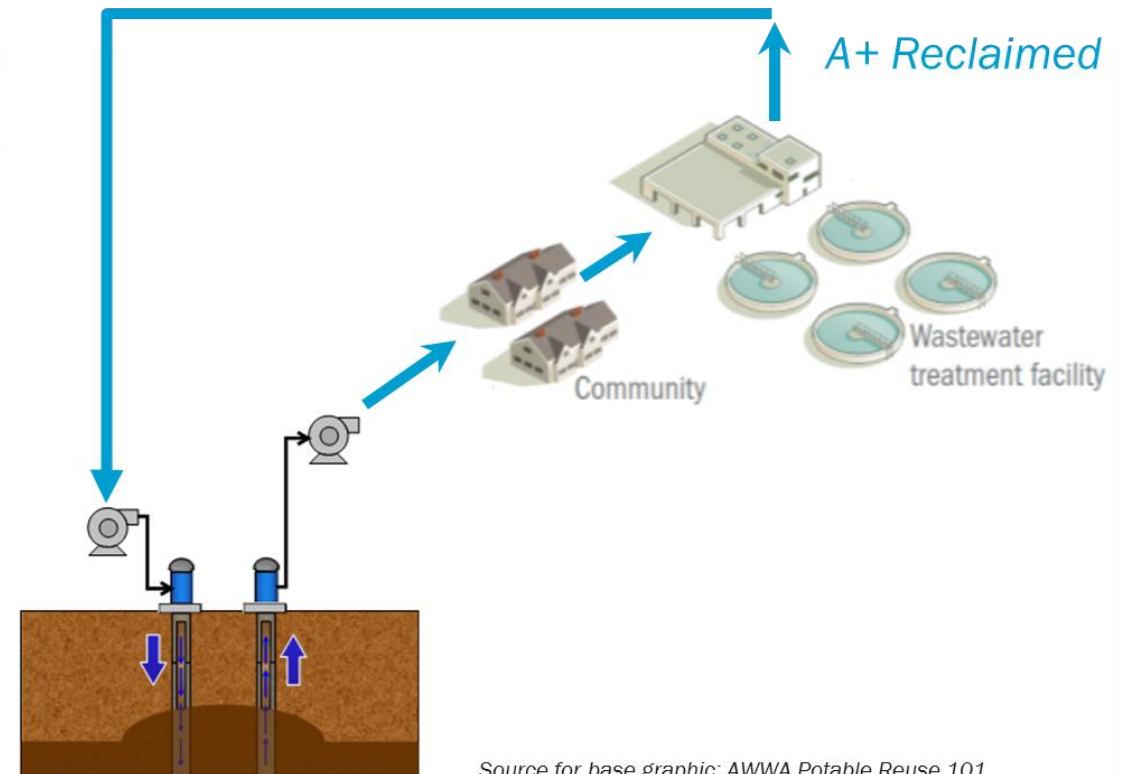
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Definition of Potable Reuse

Indirect Potable Reuse by Surface Water Augmentation



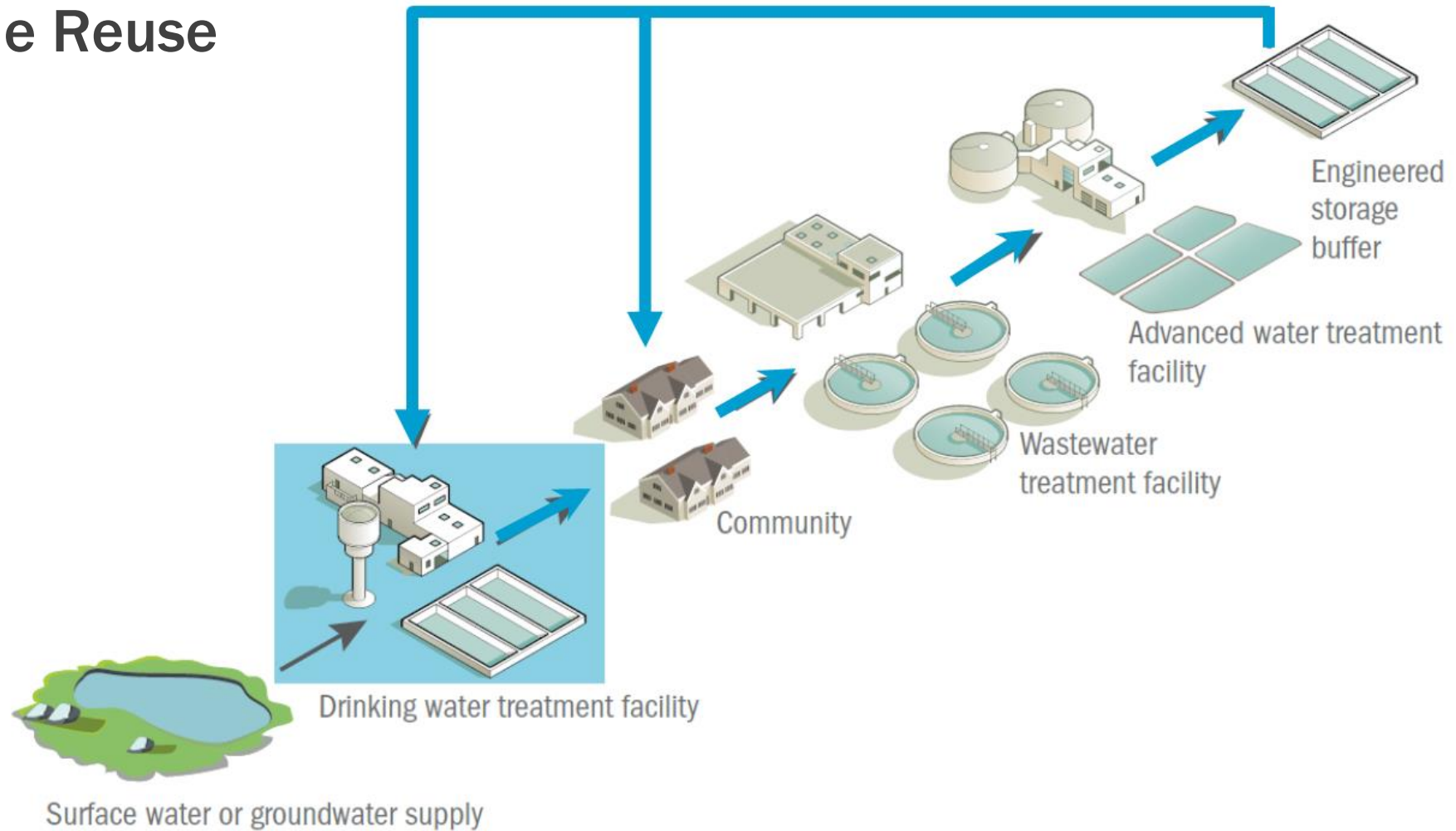
Indirect Potable Reuse by Groundwater Recharge



Source for base graphic: AWWA Potable Reuse 101

Definition of Potable Reuse

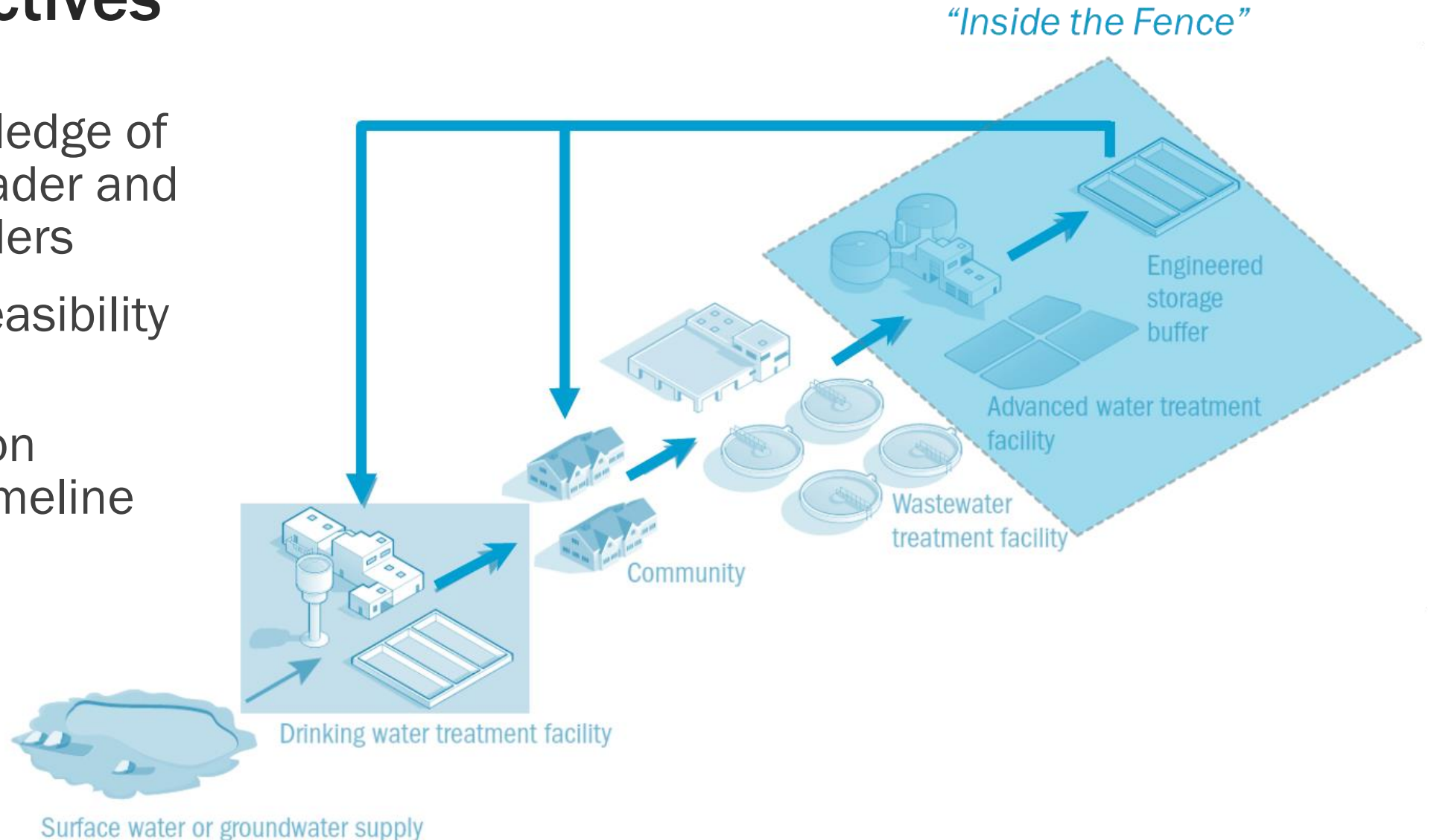
Direct Potable Reuse



Source: AWWA Potable Reuse 101

Study Objectives

- Basis of knowledge of community leader and key stake holders
- Engineering feasibility (cost)
- Implementation actions and timeline



Stakeholder Interviews

Conducted by Katz and Associates May 2018

Groups Interviewed

- Az Segway and Pedal Tours/Flagstaff Sports Exchange
- City of Flagstaff Mayor
- City of Flagstaff, City Council
- City of Flagstaff Water Commission
- Coconino County District 1
- Coconino County Superior Court
- Economic Collaborative of Northern Arizona
- Friends of Flagstaff's Future
- Friends of the Rio de Flag
- Greater Flagstaff Chamber of Commerce
- Northern Arizona Leadership Alliance
- Northern Arizona Association of Realtors

Topics Covered

- ✓ **Opinion of Adequacy of Water Supplies**
- ✓ **Awareness of planning for new water supplies**
- ✓ **Awareness of recycled water use**
- ✓ **Potential use of recycled water as source for drinking water**
- ✓ **Trusted sources of information regarding water issues**

Stakeholder Interviews

Awareness of recycled water use

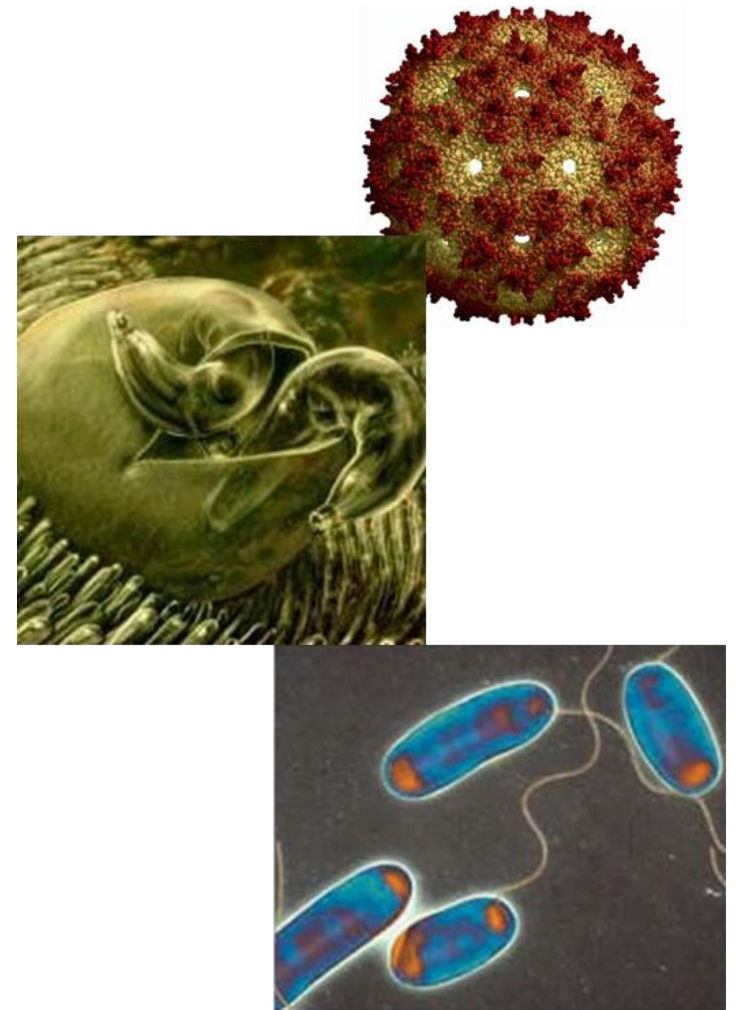
- Very aware of current uses
- Concerned there is not enough supply to maintain current use and potable reuse
- Concerns over water quality and effects on human health and the environment

Potential use of recycled water as source for drinking water

- Questions about pharmaceuticals and endocrine disruptors
- Preference for indirect potable reuse due to public perceptions
- Cost and energy efficiency
- Needs to be presented to public in an easily understandable way

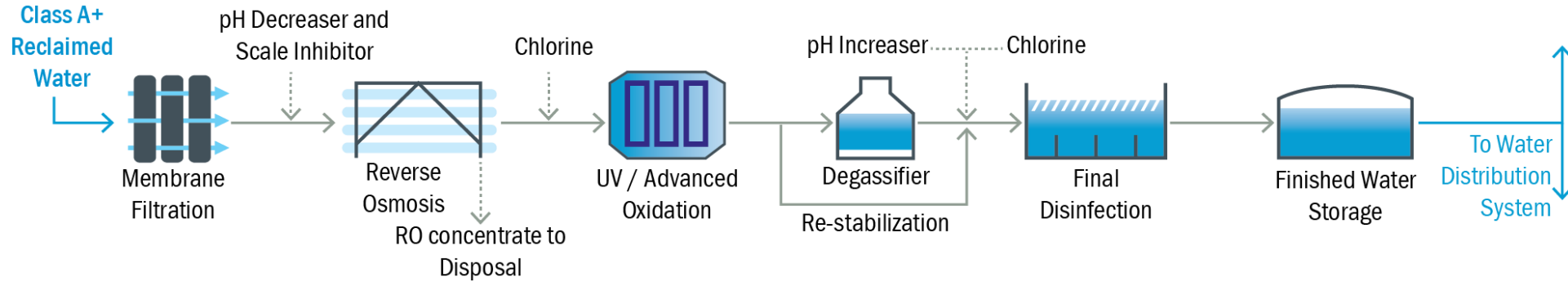
Advanced Treatment Goals

- Regulated under Safe Drinking Water Act
- Multiple Barrier Approach
- Microbial Contaminant Control
 - At least 12-log (99.999999999999%) removal of viruses
 - At least 10 log (99.999999999%) removal of bacteria
 - At least 10 log (99.999999999%) removal of protozoa
- Chemical Control
 - EPA Drinking Water Standards
 - Pharmaceuticals, Personal Care Products, other trace chemicals (CECs)
 - Total dissolved solids
- ***Community decision on “How Clean is Clean?” Water Quality Goals***

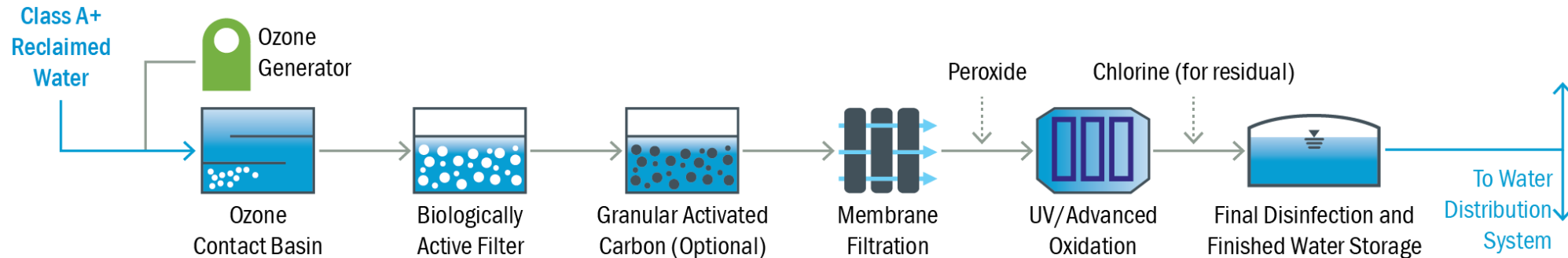


Treatment Options

Using Reverse Osmosis



Using Ozone-Biological Filter



Advanced Water Treatment Process Comparison

RO Based Process

- Excellent removal of trace chemicals
- Prevents disinfection by-product formation
- Removes salt
- Creates high salinity waste stream
- Requires minerals to re-stabilize water
- Energy consumption 122 kw/mgd

Ozone-BAF Based Process

- Excellent removal of trace chemicals
- Prevents disinfection by-product formation
- Does not remove salt
- No high salinity waste stream
- No minerals to re-stabilize water
- Energy consumption 67 kw/mgd

Rio de Flag Conceptual Site Layout

Reverse Osmosis *w/o Brine Disposal*



Ozone-BAF



Wildcat Hill Conceptual Site Layout

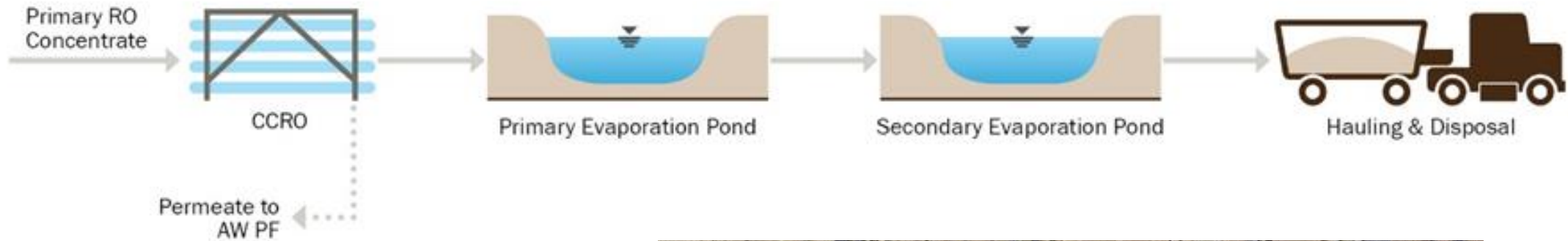
Reverse Osmosis *w/o Brine Disposal*



Ozone-BAF



RO Brine Disposal

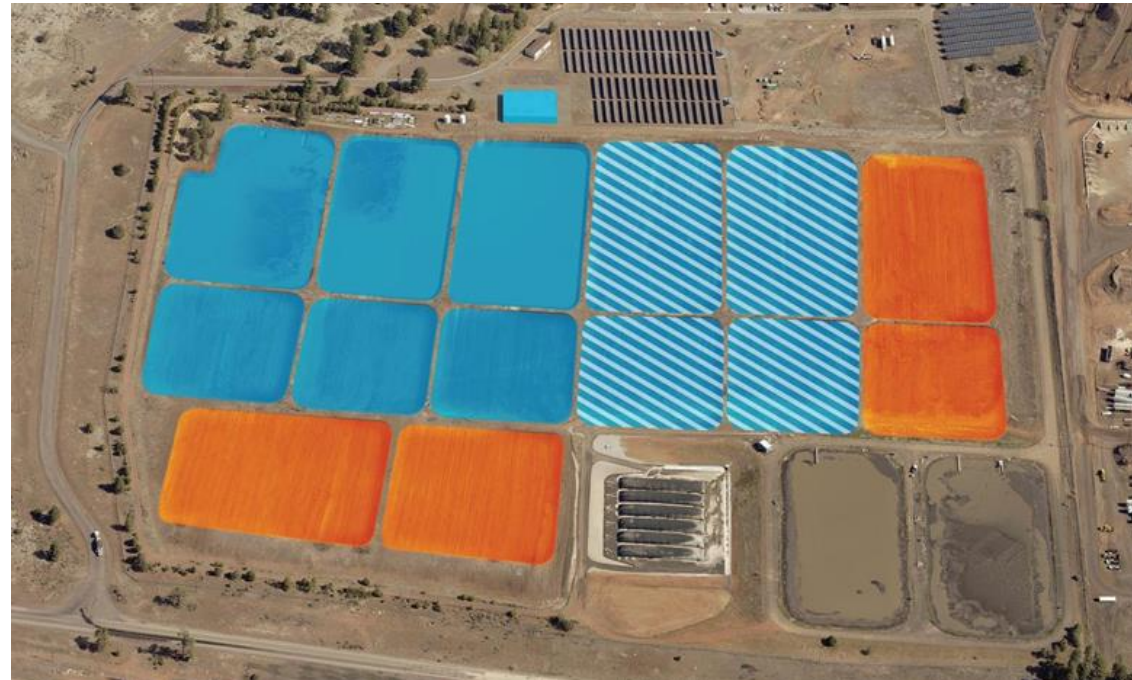


Pond sizes

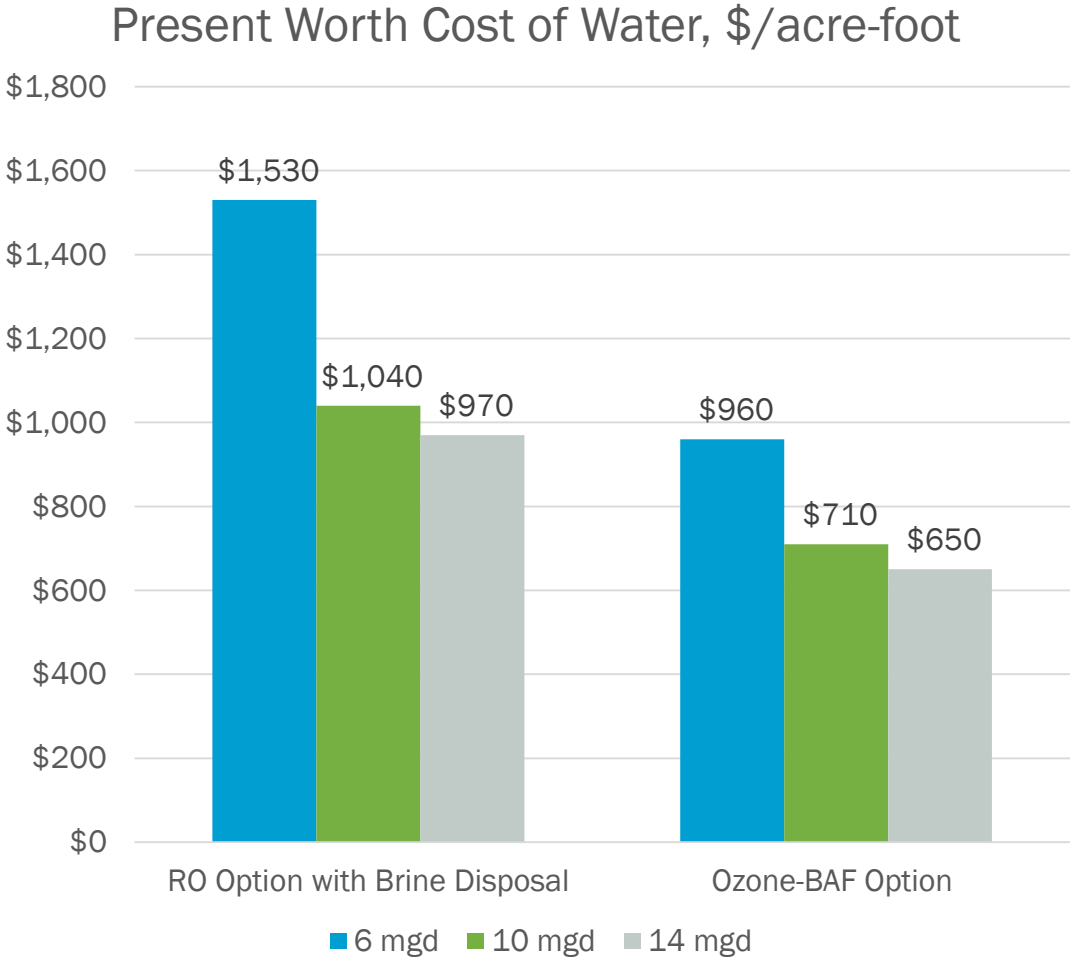
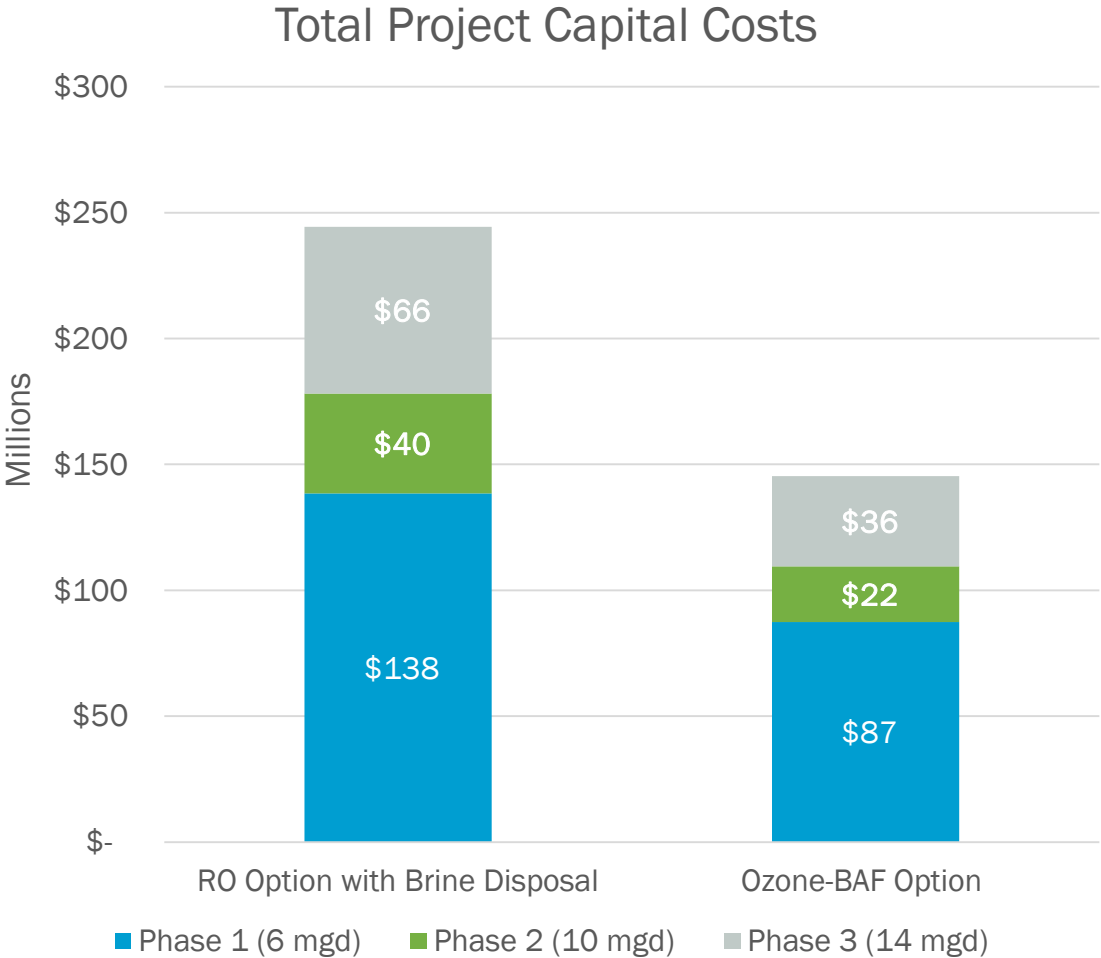
For 6 mgd: 15.3 acres

For 10 mgd: 25.5 acres

For 14 mgd: 35.7 acres



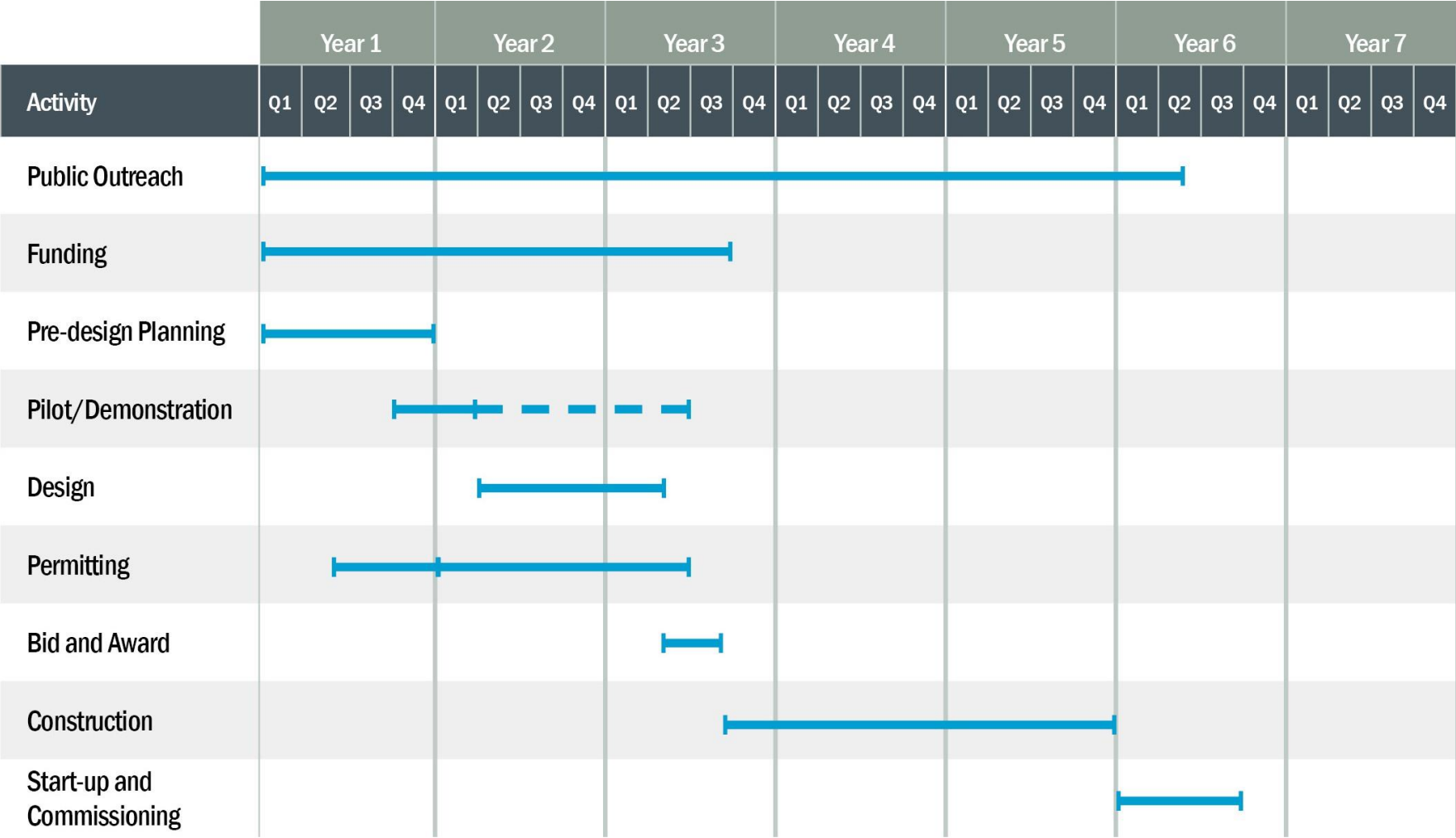
Comparison



Implementation Considerations

- Determine the Community's Water Quality Goals “How Clean is Clean?”
- Water Quality Sampling and Monitoring
- Pilot/Demonstration Facility
- Source Control Survey
- Salinity Management Model
- Operator Training and Certification
- Funding and Financing
- Compare costs & availability to possible future water supply sources (e.g., Potable Reuse (IPR, DPR), Red Gap Ranch, Water Conservation, etc)

Implementation Timeline



QUESTIONS?



it's about connecting



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essential ingredients®